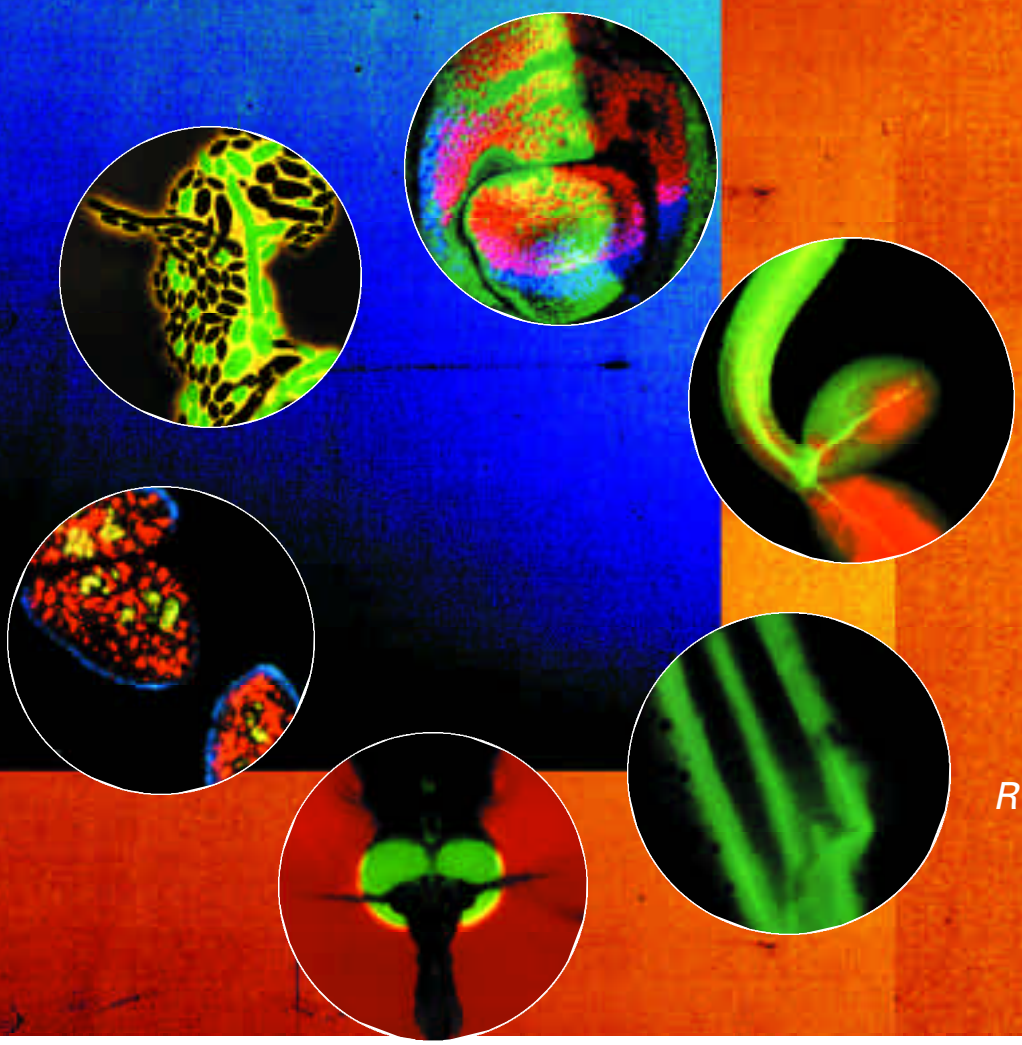
BUILDING RHODE ISLAND'S TECHNOLOGY PIPELINE

Through Investment in Research at the University of Rhode Island



Report of the Rhode Island Economic Policy Council

MARCH 2002

Abstract

Funding for research operations and infrastructure at the University of Rhode Island is compared with funding at 133 universities. Inflation-adjusted support for URI research has been flat for 20 years — a period during which support has grown significantly nationwide.

Rhode Island ranks 48th in state funds per capita spent on higher education operations, 50th in percentage of state higher education funds spent on research, and 50th in state funds per capita or state funds per $1000 personal income spent on academic research. To bring Rhode Island to national per capita levels of state funds for higher education operations would require a $54 million annual increase (+38%). To reach the national per capita average for research operations (+412%), a $22 million annual increase in state or institutional support would be needed.

URI depends more on federal funds for academic research operations than any of 92 public universities in the comparison group. The University's spending per capita for research in oceanography and psychology is above average, but spending for engineering, physical sciences, mathematical sciences, computer sciences, life sciences, and social sciences is below average. URI expenditures on research infrastructure are under national averages and significantly less than the top 100 research universities. At least $10 million annually is needed for building construction, laboratory renovation, and equipment replacement to make URI a competitive research university.

The Policy Council advocates joint state and university planning of strategic research investments at the university to meet the state's future economic needs, building a new culture of entrepreneurship, and investment in Slater Centers to achieve an economic return on the State's research investments. The Policy Council supports URI's request for State funding for a new Environmental Biotechnology Facility as the next strategic research infrastructure investment.

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A user-accessible database that permits comparision of Rhode Island and URI with other states and universities, is available at the Policy Council website, **www.ripolicy.org**

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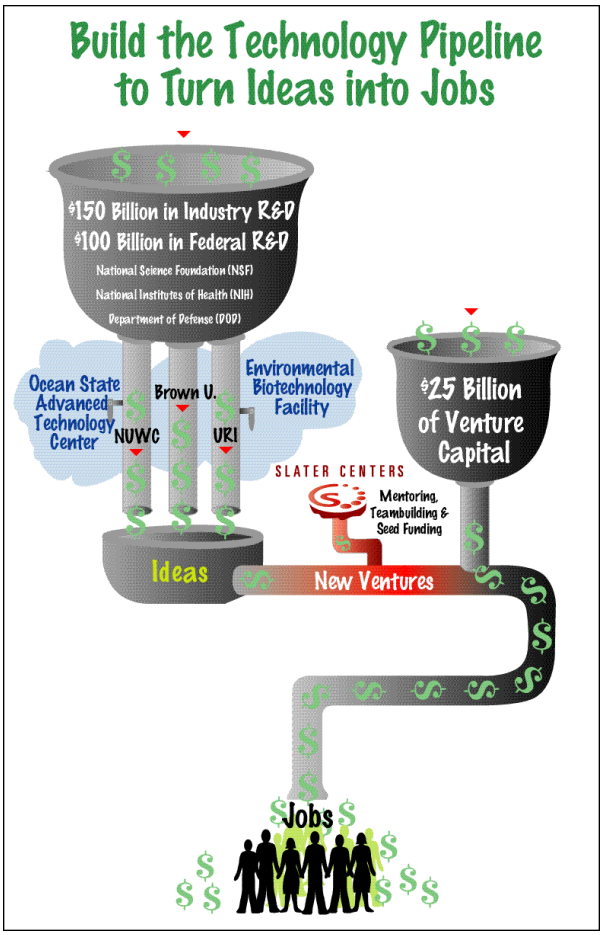
Based on research by Patrick Logan, PhD

Introduction

Over the past five years, there has been a growing recognition in public policy circles that Rhode Island's success in the new economy will rest in significant part on the state's ability to commercialize cutting-edge technologies developed at its research universities—and to retain the firms that grow from those technologies. One need only look to the Silicon Valley (fed by the intellectual capital of Stanford University and UC Berkeley), North Carolina's research triangle (fed by UNC-Chapel Hill and Duke University), or Massachusetts' own Route 128 (built on research and development generated by the Massachusetts Institute of Technology and Harvard University) to witness the enduring and constantly expanding economic impact of focused technology commercialization.



Rhode Island has taken an innovative approach to technology commercialization, creating the Samuel Slater Technology Fund in 1997. The Slater Fund now supports the establishment of four Slater Centers dedicated to mining for promising technologies developed by entrepreneurs and university-based researchers, as well as providing seed funding and business development support to launch Rhode Island-based high tech firms. While early in the process — two of the Slater Centers were founded only in 2000 — the Slater Fund has logged a promising record of achievement. More than 50 new technology companies have been established in Rhode Island, and four of those firms have attracted more than $50 million in private capital to the state. Concurrent with the state's technology commercialization initiatives, Rhode Island has attracted several new venture funds with a commitment to investing in Rhode Island.

While technology commercialization is critical, it represents only part of Rhode Island's challenge. The state's economic success also depends on our ability to grow a knowledge workforce — a robust pool of science and technology professionals who will power our new economy firms. Clearly, a strong higher education infrastructure is critical to that effort.

Incongruously, Rhode Island's renewed commitment to growing high-tech companies, and building the workforce that will staff them, comes at a time when the University of Rhode Island — the state's only public research institution — is experiencing an all-time low in state support. Rhode Island ranks 48th in state funds per capita spent on higher education operations and last in the percentage of state higher education funds spent on research. As a result, our state university is more dependent on federal research dollars than any other public research university in the nation and spends far less than the top research universities on its research infrastructure.

During a period of intense growth in both information technology and biotechnology, no new science facilities have opened at URI in these fields— resulting in a largely anachronistic physical plant. Over time, this situation will erode the University's ability to recruit and retain top faculty and students and will negatively impact its ability to develop the kind of technology that can grow new economy businesses.

Without a solid foundation in basic research at our state university, Rhode Island's technology commercialization initiatives will be limited in scope. Opportunities will dry up, as innovative faculty and students pass our state by on their way to well-funded, visionary universities. It is incumbent upon Rhode Island to invest in its technology pipeline from beginning to end — starting with an adequate investment in the research infrastructure at the University of Rhode Island. It is an achievable and affordable goal, and one that is an absolute necessity for our state's future prosperity.

Research universities nurture the new economy with leading edge research and a robust pool of graduates in science and engineering. Only 125 of approximately 4000 U.S. colleges and universities in the United States are research universities; yet, this small proportion of the higher education community produces 80 to 88 percent of the nation's scientists and engineers with advanced degrees. Rhode Island is home to two research universities — Brown University and the University of Rhode Island.

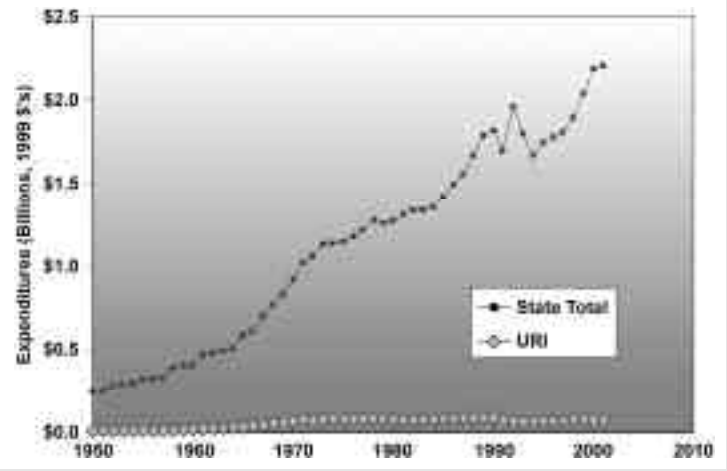
The University of Rhode Island is a public land grant university, with a tradition of providing economically relevant educational opportunities and conducting research for the public good. To fulfill its mission well, URI needs modern research and training facilities, as well as faculty who engage in research on the vanguard of rapidly evolving science and technology.

To develop a clear picture of URI's research capacity as compared to other research universities, a benchmark study of funding was conducted for the Rhode Island Economic Policy Council by Dr. Patrick Logan, PhD, Professor of Entomology at URI. Benchmark studies look at what similar institutions are doing, seeking standards and practices that can serve as models.

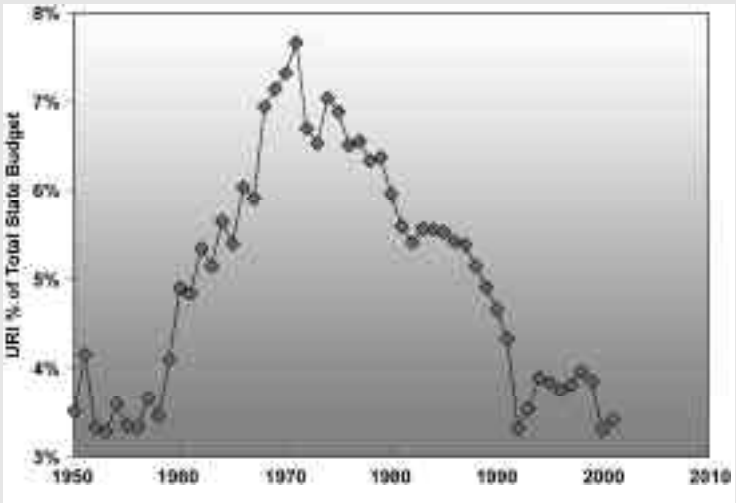
The study reveals that URI's state and institutional funding for research compares poorly with funding at other institutions — suggesting that more appropriate funding levels must be achieved if Rhode Island wants to maximize the economic impact of its public research university.

It is not too late for Rhode Island to catch up. With new investment, and with determined leadership at all levels of the University and state government, it is possible to create a science and technology-based entrepreneurial renaissance at URI. The Economic Policy Council strongly supports a targeted State investment in an environmental biotechnology facility as a next step in building Rhode Island's research infrastructure. The proposed 100,000 sq. ft. research and teaching facility at URI will require State as well as institutional and private support. Environmental biotechnology represents an area of extraordinary faculty research strength as well as strategic economic potential for Rhode Island.

What has happened to URI's research budget?



* State funding for the University grew in the 1960s, but growth had stopped by 1971. URI entered the millennium with 3% less real State support than it had 30 years ago - a period in which the state budget grew by 216%.



* With flat funding, URI's budget dropped from 7.7% of the State's total in 1971 to 3.3% in 2000. The 2001 budget portion is similar to the 1950s, when URI was a third of its present size.

Research Funding Benchmarks

Research Operations

Rhode Island is geographically the smallest state — but ranks 43rd in population and 44th in gross state product — and our per capita income is 18th in the nation. By adjusting for population and income, we compare state and institutional investments to other states and other universities to establish benchmarks for funding university research operations.

State Comparisons

Higher Education

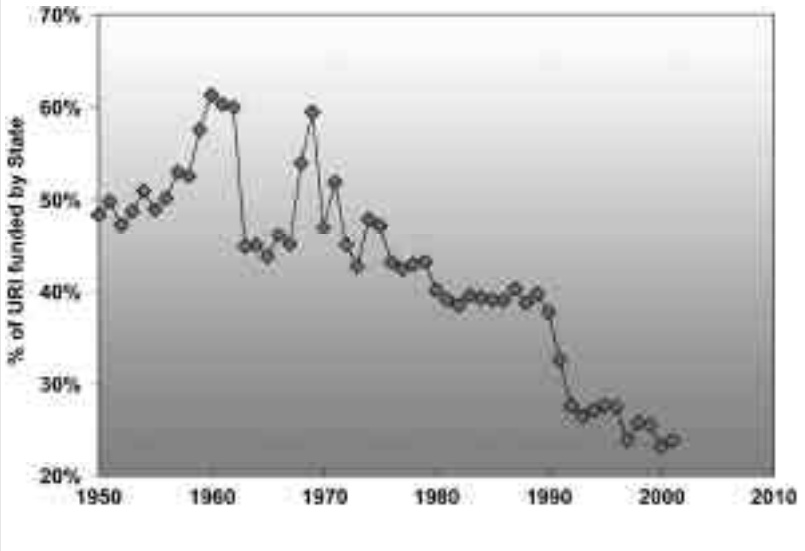
Rhode Island ranked 48th in per capita state expenditures on higher education operations in 1999, excluding expenditures for buildings or equipment, and funds from tuition. Spending was only 73% of the national average of $188.

University Research

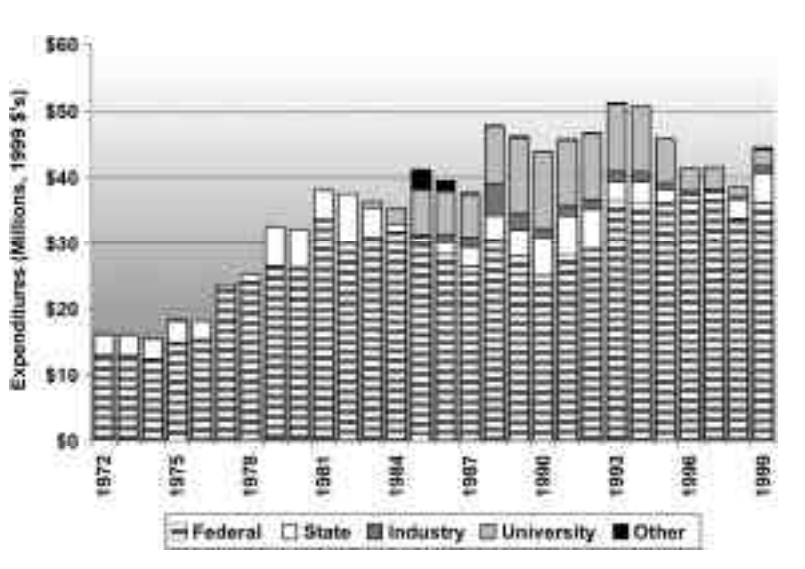
Across the nation, states fund university research — at both public and private institutions — with grants from state agencies. In addition, they provide institutional funds to public institutions. National Science Foundation data on research expenditures (mean 1997 to 1999, in 1999 dollars) reveal the following picture for the Ocean State:

• Rhode Island ranked 50th in percentage of higher education operating funds spent on research. Rhode Island spent 3.7% compared to the mean of 50 states of 13.1%.

• Rhode Island ranked 50th in per capita state support for university research. Rhode Island's $5.01 was 19% of the 50 state mean of $25.66. *If Rhode Island spent the U.S. per capita average in state funds to support university research operations, it would spend an additional $22 million annually.*



* URI has moved from "state university" to "state-assisted university." The state, which provided more than half of URI's funding in the 1950s and 1960s, provides less than one-quarter today.



* URI isn't keeping up in terms of investment in research. Institutional funds for research peaked in 1990, but had fallen 87.5% by 1998. URI depends more on federal funds for its research than almost all major research universities. While URI research expenditures increased 38% since 1980, national expenditures rose 139%.

Public Vs. Private Funding

- Of 688 U.S. universities with expenditures for science and engineering research in 1999, 392 public institutions (57%) spent 68% of total research dollars.
- State governments invested in research mostly within their own public institutions, which spent 91% of state agency grants.
- Public institutions also spent more institutional funds (derived from tuition, state appropriations, etc.) on research compared to private (24% vs 9% of institutional total).
- Private institutions depended more heavily on federal funds than public (72% vs 52% of institutional).
- The distribution of funding sources is affected more by status as public or private than it is by an affiliated hospital / medical school.

Funding for Research Operations by Field (From All Sources)

NSF reports R&D expenditures under major fields - engineering and seven sciences - with subfields for engineering, and for physical, environmental, life, and social sciences. This data reflects funds from federal, state, industry, university, and private sources. Compared to national per capita means (U.S. total expenditures/U.S. population), the following picture emerges for URI:

- URI oceanography has nearly 10 times the mean U.S. per capita funding.
- URI exceeds national per capita operational expenditures in psychology (260%), environmental sciences, including oceanography (355% of national average).
- URI is under the national average per capita for operational expenditures in all fields of engineering (24% of average over all subfields, with no expenditures for aeronautics, bioengineering/biomedical, and materials research).
- URI has low relative expenditures for mathematical sciences (0.12% of national average) and computer sciences (6%). The life sciences (14% of national average) show very low expenditures in biological and medical sciences (7.5% and 5.2% of mean).
- URI's total per capita expenditures for research operations ($39.62, with 86% deriving from federal sources) are only 42% of the national average of $93.25.

• Rhode Island ranked 50th in state spending on University research as a percentage of personal income. Rhode Island's spending of $0.18 was 18% of mean state spending of $1.004 per $1000 of personal income.

University Comparisons

In this report, the University of Rhode Island is compared to 133 universities, including all Carnegie Research I and II Universities, land grant universities, and 13 universities regarded as peers by URI. These include 92 public universities and 77 universities with hospitals. The comparison used National Science Foundation (NSF) data on research expenditures in science and engineering, averaged over 1997 to 1999, in 1999 dollars. These institutions spent 84% of U.S. funds for academic research from 1997 to 1999, including 84% of funds from the federal government, 82% from state governments, 81% from industry, 87% from institutional funds, and 79% from other sources.

URI's dependency on federal funds for research

From 1997 to 1999, 86% of URI's research was federally funded. Only six institutions in our sample–including no other public university and no other land grant university–were more dependent on federal funds. No public university or land grant university had a smaller percentage of research funds from institutional sources than URI. Adding state grants was insufficient to lift URI or Rhode Island from the bottom rank of state research investments. URI has not significantly compensated with funds from industry: 88 of the other 92 public institutions had a higher percentage of research funds coming from industry.

Benchmarks for Research Operations *(Using National Average as Goal)*

• Attaining U.S. average per capita state support for higher education operations would require a 38% increase in Rhode Island, or $51.52 per capita ($54 million) annually.

• Attaining average per capita state support for university research operations would require a 412% increase, or $21.64 per capita ($22 million of the increase to higher education).

Research Infrastructure

For Rhode Island to spur its economy through university research, URI needs to construct new research space, renovate old buildings and laboratories, and replace or upgrade equipment. What are the appropriate funding benchmarks?

Buildings and Laboratories. The National Science Foundation reports on facilities every two years, summarizing the quantity and quality of research space for science and engineering. "Scientific and Engineering Research Facilities at Colleges and Universities, 1998," published by the NSF in October 2000, represented 660 colleges and universities. Of these, 57 percent (378) were doctorate-granting, including the "top 100" and "other" institutions, based on R&D expenditures.

Doctorate-granting institutions account for 85% of instructional and research space in all academic fields, and 91% of instructional and research space in science and engineering. The top 100 universities account for 71% of research space and 81% of expenditures.

Quantity of research space. Space allocated to research at URI is only 56% of the mean for doctorate-granting institutions, and 24% of the top 100.

Distribution of space among science and engineering fields Research space allocated to Environmental (Earth, Atmospheric, and Ocean) Sciences is proportionately high at URI, as is space for psychology, engineering, and human development sciences. Comparatively smaller proportions of research space are devoted to physical sciences, mathematics and computer sciences, biological and medical sciences, and the remaining social sciences. Space for biological sciences is 4% of all campus space at URI and 22% nationally.

Adequacy of space. For all fields of science except mathematics, at least half of U.S. institutions report inadequate amounts of space for research. Space for science and engineering research increased 28% from 1988 to 1998, but across all science and engineering fields only 39% of facilities are considered "suitable for use in most scientifically sophisticated research." URI reflects the national trend. Most of its buildings and laboratories are 30-90 years old and due for renovation or replacement.

Essential Construction and Renovation

In 1998, URI estimated that it needed 85,000 sq. ft. of new research space. In 1999, the University's Environmental Biotechnology Initiative called for construction of an additional 85,000 sq. ft. of new core facilities in genomics, transgenics, imaging, and informatics, plus 10,000 sq. ft. of specialized greenhouse space that allows isolation of transgenic plants and a 10,000 sq. ft. building to support related field agriculture.

In 1998, URI estimated that it had $55 million in needed but unfunded renovations and $0.6 million in new construction needs. The biotechnology building recommended in 1999 would add approximately $50 million to those costs.

Funding sources for construction and renovation

In 1996/97, U.S. public universities funded S&E research facility renovation from state/local (49%) or institutional funds (27%). URI funded 1996/97 renovations almost exclusively from state funds (98%) with only 2% of the costs covered by institutional funds. Nationally, 1996/97 university construction costs were covered by state funds (47%) and institutional funds (43%, including 13% private, 13% institutional, and 13% tax-exempt bonds). At URI, 1996/97 construction used 13% federal and 79% institutional funds (includes private 14%, institutional 8%, and bonds 56%). URI pays debt service on bonds.

Changes over the past decade

U.S. academic research space increased 28% in the last 10 years, with space requiring renovation or replacement increasing even faster in all fields but mathematics. Outside of medical schools, renovation needs in social, medical, environmental, agricultural, and biological science more than doubled in terms of square footage. At URI, renovation averaged $1 million annually from 1996 to 1999 — clearly not keeping pace with $55.5 million in needs. URI's research facilities grew by four projects from 1996 to 2001, creating space in atmospheric, natural resource, and social sciences, and industrial engineering-with no change for other fields.

Keeping Up With Advances in Technology

Maintaining a leading edge in research and graduate education in the sciences and engineering requires constant upgrading of buildings, laboratories, and major equipment. Major ("fixed") items - such as expensive instruments with life expectancies of more than two years - include such tools as electron microscopes, robotic gene sequencers, and automatic chemical analyzers. Even expensive and sophisticated instruments are outdated in 3-5 years when technology advances rapidly. State-of-the-art laboratories may require renovation after 15-20 years, and buildings may prove inadequate in only 30 or 40 years, requiring renovation or replacement.

Issues

In the overview to "Scientific and Engineering Research Facilities at Colleges and Universities, 1998," NSF outlines the critical research space issues for the nation. These translate directly into issues for Rhode Island and URI policy makers:

- *How much space is there for conducting science and engineering (S&E) research?*
- *Is this enough space to meet the Nation's S&E research needs?*
- *What is the condition of this space?*
- *How much new S&E space needs to be constructed? How much of the existing S&E space needs repair or renovation?*
- *How much construction and repair/renovation is taking place and what does it cost?*
- *How do colleges, universities, and biomedical institutions fund these capital projects?*
- *How has the situation changed over the past decade?*

Equipment

NSF reports institutional data on expenditures for fixed equipment in its "Survey of Scientific and Engineering Expenditures at Universities and Colleges." Rhode Island ranked 20th in total (for all funding sources) per capita spending for equipment during 1997-99, with 84% of RI expenditures coming from federal sources, compared to 57% nationally. Rhode Island's state expenditures ($0.83 per capita) were 43% of the national average, ranking it 45th in the U.S.

Benchmarks for Infrastructure

Construction and Renovation. Basing benchmarks for state funding for infrastructure on U.S. per capita means—as was suggested for research operations—will not suffice to meet needs. If Rhode Island used national average per capita state investment in construction and renovation as a benchmark, it would spend ~$3.3 million annually for academic research construction and ~$1.1 million annually for renovation. This would permit construction of less than one new science or engineering building every other decade, and it would never clear the $55 million backlog of renovations.

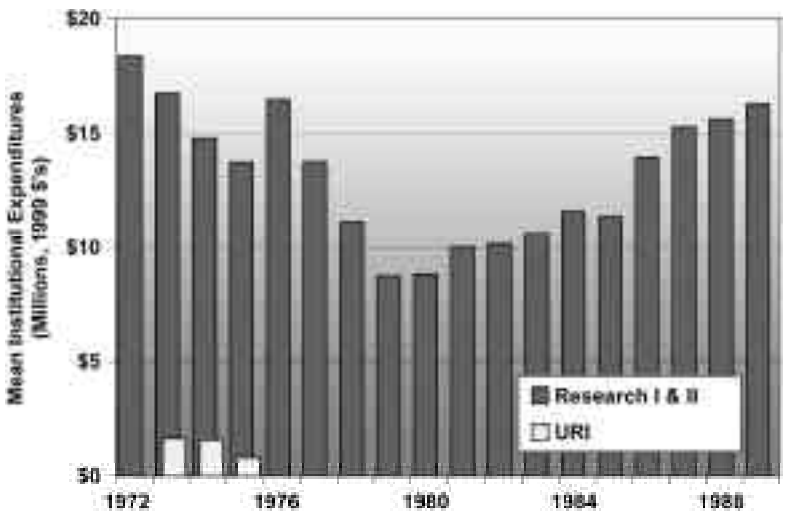
URI needs to eliminate the research infrastructure backlog and to build new laboratories. The benchmark needs to be at least a doubling of the 1996/97 average renovation and construction figures (i.e., to $2.2 and $6.6 million of state or institutional funds annually), approximately the annual mean figures for the top 100 institutions (i.e., $1.9 and $6.3 million annually). It would also help if the state paid interest on the bonds it uses to fund new construction. These benchmarks would permit a schedule for renovation that better matches the pace of deterioration and would allow construction of a major new facility once each decade.

Equipment. Attaining average per capita state support for fixed research equipment would require a 131% increase (over 1999) to $2.0 million annually.

The total benchmark for S&E infrastructure-comprising con - struction, renovation, and fixed equipment-would thus be at a minimum ~$11 million annually (~60% for construction, 20%

The 1970s and 1980s

Through 1989, NSF published data on research capital expenditures, including construction, renovation, and fixed equipment. From 1972 to 1989, URI capital expenditures were $1.3 million (89% federal) - only 1.7% of the institutional mean of Carnegie Research I & II Universities.



The 1990s

In the 1990s URI built new research space in the Kirk Applied Engineering Lab, the Cancer Prevention Research Center, the Kingston Campus Coastal Institute Building, and the Center for Atmospheric Chemistry Studies. Yet, the University's total spending for construction and renovation of research space since 1970 remains under the annual capital spending of many "top 100" universities.

for renovation, and 20% for equipment).

At URI, increased support for research must be based on more than simple fiscal benchmarks. Achieving adequate research funding at URI will require vision, leadership, and a plan for the investment. The obvious place to start is building on existing university strengths. For the long term, the university can build new strengths in areas critical to Rhode Island's future.

Start with Natural Advantages

URI possesses some current natural advantages, which it has used to target academic investment in four focus areas—Marine and the Environment; Health; Children, Families, and Communities; and Enterprise and Advanced Technology. Beyond the University, the Slater Centers invest in industry-university collaborative technology commercialization based on Rhode Island's strengths in biomedical technology, design innovation, progressive manufacturing, marine technology, environmental biotechnology, and interactive technologies.

Plan for Future Needs

Do not underestimate the potential of university research to transform regional as well as global economies. One of the best studies of the economic impact of research universities is the 1997 BankBoston study of the Massachusetts Institute of Technology, "MIT: The Impact of Innovation." The 4000 companies founded by MITgraduates – including Hewlett-Packard, Rockwell International, Raytheon, McDonnell Douglas, Digital Equipment, Texas Instruments, Intel, Gillette, and even Campbell Soup – have annual sales equivalent to the 24th largest national economy in the world. The study makes it clear that MIT's hands-on approach to education, encouraging students to solve real-world problems with guidance from faculty with experience beyond the university, instills unparalleled entrepreneurial spirit and state-of-the-art technical and business skills.

Building a prosperous future for Rhode Islanders requires a cogent vision of the new economy, involvement of colleges and universities in building that economy, and the resources needed to provide adequate state support for academic research and teaching. We need to build a funding stream to drive scientists or engineers to work on the highest priority needs of the future economy and a culture of entrepreneurship and outreach to extend new ideas from the university into the world.

Starting Points

URI's natural advantages can be harnessed to address the needs of Rhode Island's technology-based industry clusters. There are three areas of strength that stand out:

- With nearly 1 in 10 URI faculty in the biological sciences there is a need for centralized facilities for biotechnology. The Environmental Biotechnology Initiative is a project that stands out as building on URI's existing strengths.
- The Graduate School of Oceanography's research strength warrants investments in marine technology.
- Facets of grant-competitive engineering research programs may provide insights regarding future research centers.

Environmental Biotechnology Initiative. There is an urgent requirement at URI for modern laboratory space in the biological sciences and associated state-of-the-art equipment. The Environmental Biotechnology Initiative calls for a new 100,000 sq. ft. building designed with centralized core facilities for molecular biology/biotechnology, including functional genomics (the capacity to look at the expression of thousands of genes at once), proteomics (the growing capacity to similarly follow the expression patterns of thousands of proteins at once), biocontrol facilities for working with potentially toxic organisms, DNAsequencing capabilities, bioinformatics (the science of analyzing and comparing massive amounts of DNA sequence information), transgenic facilities with the capacity to produce genetically altered plants, animals and microorganisms, plant and animal growth facilities, research laboratories, learning laboratories, offices and support facilities. The estimated cost for the facility is $60 million exclusive of equipment. A $500,000 State investment is requested in FY2002 for design work.

Biotechnology holds tremendous scientific and economic promise. We have entered the century of biotechnology, and specifically a time when our growing knowledge of the genomes of many organisms is the essence of much of what goes on in all fields of the biological sciences. New agricultural and medical biotechnologies have improved the quality and span of human life, while at the same time their development has driven substantial economic diversification in the regions where these technologies have grown-up.

At URI, marine and environmental issues are a major focus for education and research. The Environmental Biotechnology Initiative came together from grassroots efforts within the university community and it complements the State's Slater Center investment in Marine and Environmental Technology. The Economic Policy Council strongly supports this targeted investment in environmental biotechnology research facilities. The proposed research facility will increase the sophistication of research that can be conducted at URI in biotechnology with commercial applications in such areas as aquaculture, turf, environmental remediation, insect control, drug development, medicine, forensics, food safety and public health. New facilities will help URI keep its best faculty, attract the most outstanding new faculty and students, and substantially grow the amount of research dollars the university receives from the federal government and industry.

While URI is seeking planning money for a new Environmental Biotechnology research facility, the Environmental Biotechnology Initiative is also about specialized educational programs that will help train the technology talent needed by such growing Rhode Island employers as Immunex and Dow Biopharmaceutical Contract Manufacturing Services. The Environmental Biotechnology Initiative directly supports Rhode Island's economic strategy of growing jobs in our five high-wage clusters including biotechnology.

Together the state and the university need to set priorities for investments such as the Environmental Biotechnology Initiative and other centers that require major infrastructure and program development commitments. The Economic Policy Council should be an active participant in this planning process.

The Policy Council has a responsibility to partner with the University of Rhode Island in examining Rhode Island's economic opportunities and identifying where to invest to develop the technology, and perhaps more importantly, the talent to achieve success in the new economy. The University must work closely with the state to meet Rhode Islander's needs as they face a changing economy.

Strategies for targeting research investment must include both significant educational return and significant outreach (i.e., active engagement with target audiences who will benefit from research, advanced education, or technical collaboration). It is an unmistakable characteristic of every succcessful research center that the centers have clear educational or outreach missions, and often both.

Entrepreneurial Culture for Learning

In its academic and research endeavors in science, engineering, and business, URI must develop a new culture for learning. Science, engineering, and business departments can better adjust the technical components of their curricula and enhance hands-on experiential learning through involvement in on-campus research centers and near-campus research/technology partnerships—thereby keeping on the leading edge. Economically-focused research centers can balance basic research with greater engagement with business and technology leaders outside of the university — made possible through research collaboration and technical exchanges. Importantly, this kind of encouragement creates feedback on the preparation of university graduates and their value as inventors, high technology employees, or entrepreneurs. Active pursuit of feedback is the hallmark of an institution concerned with the quality of its product.

Slater Centers Turn Ideas into Jobs

Investment in Slater Centers helps turn the ideas generated by university research into Rhode Island jobs. The Slater Centers identify research with market potential from universities and federal labs and act as mentors in the venture development process. Slater Centers invest early-stage seed money into promising Rhode Island technology ventures and actively help these young companies attract private capital. The Slater Centers only date back to 1997 and 2000, but have marked some significant early milestones:

• The Slater Centers have launched or made strategic contributions to the growth of 59 high-tech startups in five years.

• The experience of the most mature of the Centers – the Slater Center for Biomedical Technology – illustrates the potential of the Slater Fund to leverage outside investment. The Center has invested $2.6 million in 23 companies, which have in turn attracted $73.8 million in venture capital, private investment, and federal funding – $51 million of which represents private investment obtained by four companies, in which Slater Biomed invested a collective $575,000.

• These startup and early-stage companies already employ over 250 Rhode Islanders – a number that will grow significantly as they grow to scale and take products to market.

• Several Slater-funded firms are poised to achieve significant business development milestones – ranging from attracting private investment to taking products to market – in the near future.

• An important secondary benefit of the Slater Centers is Rhode Island's growing currency in the investment community. Five years ago, there was a paucity of venture investment in Rhode Island. Today, firms like Zero State Capital, Village Ventures, Rex Capital and Merchantbanc are doing business here – encouraged in large part by the important early seed investments made by the Slater Centers and by productive working relationships with Center directors. Several Centers have persuaded venture capitalists and serial entrepreneurs to serve on their boards.

The Slater Centers help ideas flow through a very critical stretch of the technology pipeline where scientists and engineers have to leave the academic setting and partner with entrepreneurs and investors. Investment in Slater Centers helps Rhode Island maximize the economic return on investment in university research.

Ideally, the Slater Fund would operate on a $5 million annual investment from the Rhode Island General Assembly. At an individual funding level of approximately $1.2 million, each Center could leverage the expertise of its entrepreneurial director and allow for 8-10 investments on an annual basis. In an effort to get to the $5 million, the Policy Council is seeking a $4 million appropriation for FY2003.

Interact with NUWC to Commercialize Research

The Naval Undersea Warfare Center, on Aquidneck Island, is another powerhouse of idea generation. The proposed Ocean State Advanced Technology Center (OSAT) will help Rhode Island move ideas out of the laboratory and into the economic arena through exploring technology applications, venture incubation, and community outreach. OSAT will conduct blue-sky research on the applications of NUWC knowledge of the littoral environment, autonomous underwater vehicle technology, and other fields. OSAT will also explore the feasibility of using NUWC technology to provide real-time monitoring of the environmental quality of Narragansett Bay as both an opportunity for environmental stewardship and market development. This center will have synergies with University of Rhode Island research strengths in Oceanography and in Ocean Engineering.

The Slater Center for Marine and Environmental Technology will partner closely with OSAT to incubate start-up businesses commercializing ocean technology within the OSAT facility. Currently the Policy Council and NUWC are seeking state financing and federal funds to design OSAT and support its research agenda.

It is incumbent upon Rhode Island to invest in research at the University of Rhode Island and to carve out a clear and compelling role for the University in meeting the state's future economic needs. State investment in Slater Centers combined with efforts to build an entrepreneurial culture assure that our investment in university research will pay-off for Rhode Island.

The Rhode Island Economic Policy Council

Composed of representatives from business, labor, higher education and government, including Governor Almond and leaders of the Rhode Island General Assembly, the Rhode Island Economic Policy Council provides objective analysis of the strategic challenges facing the state's economy. The Policy Council develops new initiatives to seize key economic opportunities, and helps to mobilize the public and private resources to assure that the initiatives succeed. The Policy Council is a nonprofit corporation equally funded by the private sector and the State of Rhode Island.

Co-chairs

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Paul J. Choquette, Jr.	*President & Chief Executive Officer, Gilbane Building Company*

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Gary Sasse	*Executive Director, Rhode Island Public Expenditure Council*
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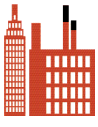
Building Rhode Island's Technology Pipeline is one of the Policy Council's projects to mobilize resources for Rhode Island's economic strategy: *Ten Ways to Succeed Without Losing Our Soul*.

Building Rhode Island's Technology Pipeline fits into both the Clusters and People themes. Research universities are important in supporting a vital entrepreneurial culture in high technology industries. Research universities produce ideas that can evolve into new business opportunities, but most importantly research universities are the training ground for scientific and technological innovators of tomorrow.

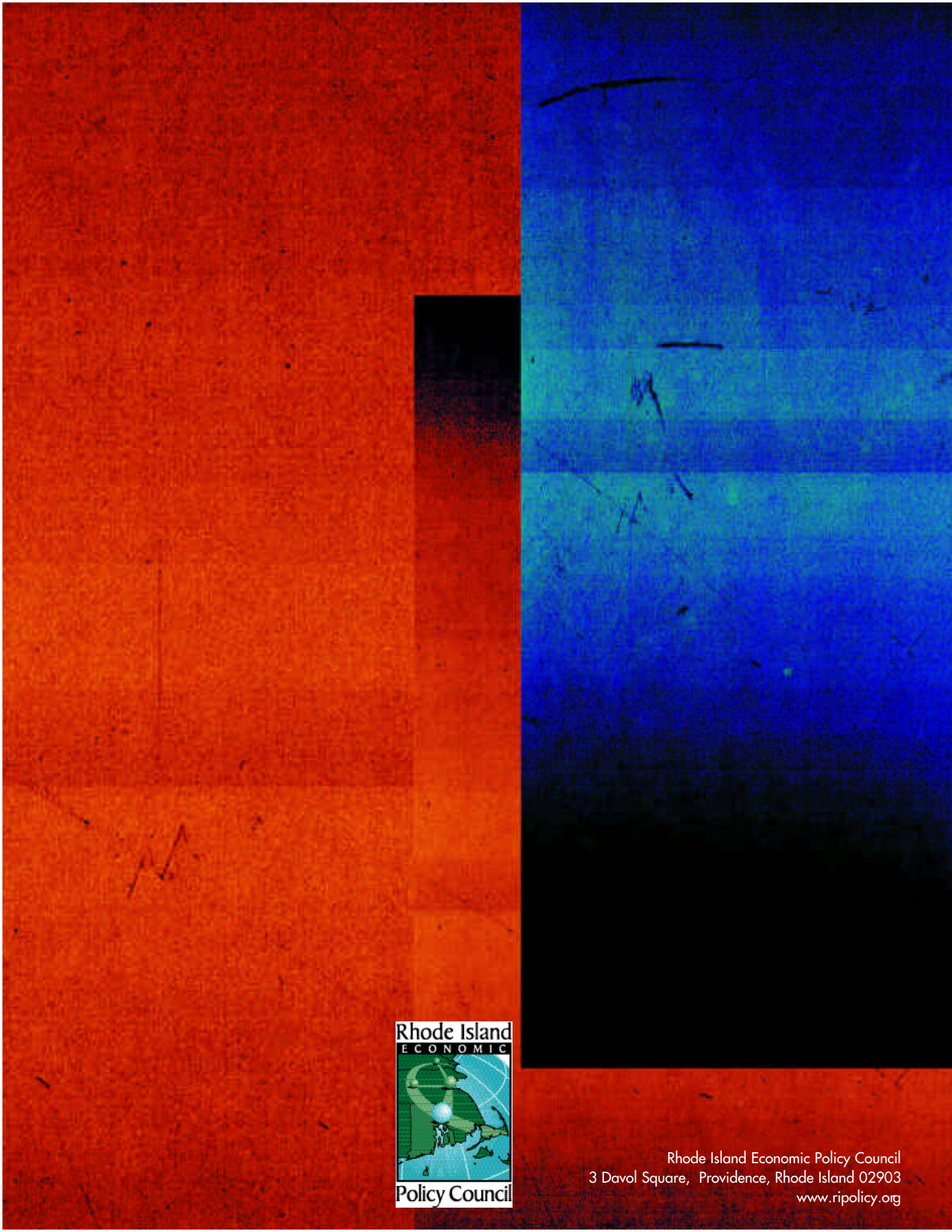
PLACES
Strategy 1: Develop economic niches based on place
Strategy 2: Nurture vibrant, walkable and authentic places

PEOPLE
Strategy 3: Create Grade 7-16 career pathways
Strategy 4: Scale up adult literacy programs and build career ladders



CLUSTERS
Strategy 6: Grow the top and hold the middle
Strategy 7: Create a vital entrepreneurial culture in high tech industries
Strategy 8: Promote sustainable use of Narragansett Bay

CONNECTIONS
Strategy 9: Move people better
Strategy 10: Move goods better



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